

What we claim is:

1. A method for positioning a prosthetic terminal device at desired orientations with respect to the distal end of an arm prosthesis to perform useful functions, comprising the steps of:

providing a prosthetic wrist unit having a back section adapted to receive the distal end of an arm prosthesis, a front section rotatable relative to said back section with respect to a longitudinal axis extending through said arm prosthesis, and quick disconnect connection means having a receptacle for releasable attachment of a terminal device thereto, said connection means pivotal about a transverse axis with respect to said longitudinal axis;

releasably attaching a terminal device to said connection means;

positioning the front section of said wrist unit and attached terminal device to a desired rotated pronation or supination orientation with respect to the longitudinal axis; and

positioning the connection means and attached terminal device to a desired angular flexion or extension orientation with respect to the transverse axis; whereby

the terminal device is positioned with respect to the distal end of the arm prosthesis and manipulated to perform useful functions.

2. The method according to claim 1, wherein

said wrist unit further comprises angular positioning means connected with said quick disconnect connection means and flexion locking means on said wrist unit engageable with said angular positioning means; and

said step of positioning said connection means and attached terminal device comprises the further step of releasably locking said connection means at the desired angular flexion or extension orientation with respect to the transverse axis by engaging said flexion locking means with said angular positioning means.

3. The method according to claim 2, wherein

said flexion locking means comprises a retractable spring loaded flexion locking element mounted on said wrist unit, and said angular positioning means has a plurality of radially spaced apertures in an arcuate pattern about the transverse axis; and

said step of releasably locking said connection means is accomplished by moving said flexion locking element to a spring biased locking position releasably engaged with a selected one of said radially spaced apertures;

said flexion locking element being movable to a retracted position disengaged from said angular positioning means to allow pivotal movement of said quick disconnect connection means.

4. The method according to claim 3, wherein

a flexion control cable is connected with said flexion locking element; and

said flexion locking element is moved to its said retracted position by tensioning said flexion control cable, and is moved to its said locking position engaged with a selected one of said radially spaced apertures by releasing the tension in said flexion control cable.

5. The method according to claim 4, wherein

said wrist unit further comprises retaining means operatively connected with said flexion locking element; and

said step of moving said flexion locking element to its said retracted position is accomplished by tensioning and releasing tension in said flexion control cable a first time to retain said flexion locking element its said retracted position, and is moved to its said locking position engaged with a selected one of said radially spaced apertures by tensioning and releasing tension in said flexion control cable a second time.

6. The method according to claim 3, wherein

said quick disconnect connection means is pivotal through a range of from 0° to more than 45° about the transverse axis, said wrist unit further comprises tension spring means operatively connected with said quick disconnect connection means; and

said step of moving said flexion locking element to its said retracted position allows said tension spring means to return said quick disconnect connection means to a position wherein its said receptacle is in a plane parallel with the longitudinal axis.

7. The method according to claim 1, wherein

said wrist unit further comprises rotary positioning means connected with said front section and rotation locking means on said back section releasably engageable with said rotary positioning means; and

said step of selectively positioning said front section and the attached terminal device comprises the further steps of rotating said front section and said rotary positioning means as a unit, and releasably locking it at the desired rotated pronation or supination orientation with respect to the longitudinal axis by engaging said rotation locking means with said rotary positioning means.

8. The method according to claim 7, wherein

said rotary positioning means has a plurality of equally spaced apart apertures in a circular pattern;

said rotation locking means is a retractable spring loaded rotation locking element mounted on said back section; and

said step of releasably locking said front section is accomplished by moving said rotation locking element to a spring biased locking position engaged with a selected one of said spaced apart apertures;

said rotation locking element being movable to a retracted position disengaged from said rotary positioning means to allow rotation of said front section and said rotary positioning means as a unit.

9. The method according to claim 7, wherein

said wrist unit further comprises torsion spring means operatively connected with said rotary positioning means, and stop means disposed between said back section and said rotary positioning means;

said front section and said rotary positioning means are rotatable as a unit about the longitudinal axis through a range exceeding 270° in a clockwise or counter clockwise direction; and

said step of moving said rotation locking element to its said retracted position allows said torsion spring means to return said front section and said rotary positioning means as a unit to a predetermined stop position engaged with said stop means.

10. The method according to claim 7, wherein

a rotation control cable is connected with said rotation locking element; and

said rotation locking element is moved to its said retracted position by tensioning said rotation control cable, and is moved to its said locking position engaged with a selected one of said spaced apart apertures by releasing the tension in said rotation control cable.

11. The method according to claim 10, wherein

said wrist unit further comprises retaining means operatively connected with said rotation locking element; and

said step of moving said rotation locking element to its said retracted position is accomplished by tensioning and releasing tension in said rotation control cable a first time to retain said rotation locking element its said retracted position, and is moved to its said locking position engaged with a selected one of said spaced apart apertures by tensioning and releasing tension in said rotation control cable a second time.

12. A multi-function body-powered prosthetic wrist unit for attachment to the distal end of an arm prosthesis for receiving a prosthetic terminal device and positioning the terminal device at desired orientations with respect to the arm prosthesis, comprising:

a back section adapted to be releasably attached to the distal end of an arm prosthesis;

a front section rotatably connected with said back portion to rotate relative thereto about a longitudinal axis extending through the arm prosthesis;

quick disconnect connection means pivotally mounted on said front section to pivot about a transverse axis with respect to the longitudinal axis and having a receptacle for releasably attaching a terminal device thereto;

rotary positioning means connected with said front section for selectively positioning said front section and the attached terminal device to a desired rotated pronation or supination orientation with respect to the longitudinal axis; and

angular positioning means connected with said quick disconnect connection means for selectively positioning said connection means and the attached terminal device to a desired angular flexion or extension orientation with respect to the transverse axis; whereby

the attached terminal device is selectively positioned at desired angular flexion or extension orientation and a desired pronation or supination orientation with respect to the distal end of the arm prosthesis and manipulated to perform useful functions.

13. The prosthetic wrist unit according to claim 12, further comprising:

rotation locking means on said back section engageable with said rotary positioning means for releasably locking said front section at a selected rotated orientation about the longitudinal axis; and

flexion locking means on said wrist unit engageable with said angular positioning means for releasably locking said connection means and the attached terminal device at a selected angular orientation with respect to the transverse axis.

14. The prosthetic wrist unit according to claim 13, wherein

said angular positioning means has a plurality of radially spaced apertures in an arcuate pattern about the transverse axis; and

said flexion locking means is a retractable spring loaded flexion locking element mounted on said wrist unit for movement between a locking position engaged with a selected one of said radially spaced apertures and a retracted position disengaged therefrom;

said flexion locking element in its retracted position allowing pivotal movement of said quick disconnect connection means to the desired angular flexion or extension orientation about the transverse axis, and in its locking position being spring biased into engagement with one of said radially spaced apertures.

15. The prosthetic wrist unit according to claim 14, further comprising:

a flexion control cable connected with said flexion locking element whereby said flexion locking element is moved to its said retracted position by tensioning said flexion control cable, and is moved to its said locking position engaged with a selected one of said radially spaced apertures by releasing the tension in said flexion control cable.

16. The prosthetic wrist unit according to claim 15, further comprising:

retaining means operatively connected with said flexion locking element to retain said flexion locking element in its said retracted position by tensioning and releasing tension in said flexion control cable a first time, and is moved to its said locking position engaged with a selected one of said radially spaced apertures by tensioning and releasing tension in said flexion control cable a second time.

17. The prosthetic wrist unit according to claim 14, wherein

said quick disconnect connection means is pivotal through a range of from 0° to more than 45° about the transverse axis; and further comprising

tension spring means operatively connected with said quick disconnect connection means for returning said connection means to a position wherein its said receptacle is in a plane parallel with the longitudinal axis when said flexion locking element is in its said retracted position.

18. The prosthetic wrist unit according to claim 13, wherein

said rotary positioning means has a plurality of equally spaced apart apertures in a circular pattern; and

said rotation locking means is a retractable spring loaded rotation locking element mounted on said back section for movement between a locking position engaged with a selected one of said spaced apart apertures and a retracted position disengaged therefrom;

said rotation locking element in its retracted position allowing rotation of said front section and said rotary positioning means as a unit to the desired rotated pronation or supination orientation, and in its locking position being spring biased into engagement with one of said spaced apart apertures.

19. The prosthetic wrist unit according to claim 18, further comprising:

stop means disposed between said back section and said rotary positioning means for allowing rotation of said front section and said rotary positioning means as a unit about the longitudinal axis through a range exceeding 270° in a clockwise or counter clockwise direction; and

torsion spring means operatively connected with said rotary positioning means for returning said rotary positioning means to a predetermined stop position.

20. The prosthetic wrist unit according to claim 18, further comprising:

a rotation control cable connected with said rotation locking element whereby said rotation locking element is moved to its said retracted position by tensioning said rotation control cable, and is moved to its said locking position engaged with a selected one of said spaced apart apertures by releasing the tension in said rotation control cable.

21. The prosthetic wrist unit according to claim 20, further comprising:

retaining means operatively connected with said rotation locking element to retain said rotation locking element in its said retracted position by tensioning and releasing tension in said rotation control cable a first time, and is moved to its said locking position engaged with a selected one of said spaced apart apertures by tensioning and releasing tension in said rotation control cable a second time.